

**Project Title:** Treatment of Chromite Ore Processing Residue (COPR) Using Ferrous Iron

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**Problem Definition:** Chromite ore processing residue (COPR) generated from ferrochrome production operations can act as a major source of hexavalent chromium (Cr(VI)) to groundwater. Efforts to treat this Cr(VI) source material have proven difficult. A large volume of COPR measuring approximately 20 acre-feet in size is present in the saturated zone at the Macalloy Corporation site in Charleston, S.C. Groundwater Cr(VI) concentrations in the COPR source area measure as high as 57 mg/L and pH as high as 11.5. A recent study (ES&T, 2003) explored the use of ferrous iron in column studies to treat COPR and concluded that ferrous iron was ineffective. The ineffectiveness was attributed to premature precipitation of the added iron and the consequent inability of the ferrous iron to move appreciable distances in the high pH COPR environment.

**Background:** In the presence of a reducing agent such as sodium hydrosulfite, ferrous iron can be stabilized in solution for an extended period of time. This could allow for effective dissemination of ferrous iron over significant distances even under the high pH conditions characteristic of COPR. Batch studies conducted in the laboratory indicated that ferrous iron (as ferrous sulfate) in the presence of sodium hydrosulfite was highly effective in treating the Macalloy site COPR. (Note: Sodium hydrosulfite alone was shown to be ineffective in treating the COPR.) Based on these observations, a field pilot study was initiated to evaluate the performance of a combined ferrous iron/sodium hydrosulfite reductant solution in treating saturated zone COPR in situ at the Macalloy Corporation site.

**Objectives:** The objectives of the study are to determine whether ferrous iron in the presence of sodium hydrosulfite can be effectively disseminated within the Macalloy Corporation site COPR Cr(VI) saturated zone source area and thereby achieve effective treatment of dissolved and solid phase Cr(VI).

**Approach:** 4800 gallons of a ferrous sulfate/sodium hydrosulfite solution were injected into the COPR Cr(VI) source zone at the Macalloy Corporation site through a single injection well. A series of 1-inch diameter monitoring wells were installed out radially from the injection well to evaluate the performance of the injected reductant. Groundwater samples were analyzed for multiple parameters including cations, anions, ORP, pH, conductivity, and ferrous iron.

**Accomplishments to Date:** The results of the field study indicated that ferrous iron in the presence of sodium hydrosulfite can be disseminated a significant distance within the high pH COPR and can effectively treat dissolved and solid phase Cr(VI) associated with the COPR.

**Near Future Tasks:** Publications describing the findings of the study are pending.